

PPCH™

Hydraulic Pressure Controller/Calibrator



High Performance Pressure Generation and Control
to 200 MPa (30 000 psi)...

INTRODUCTION

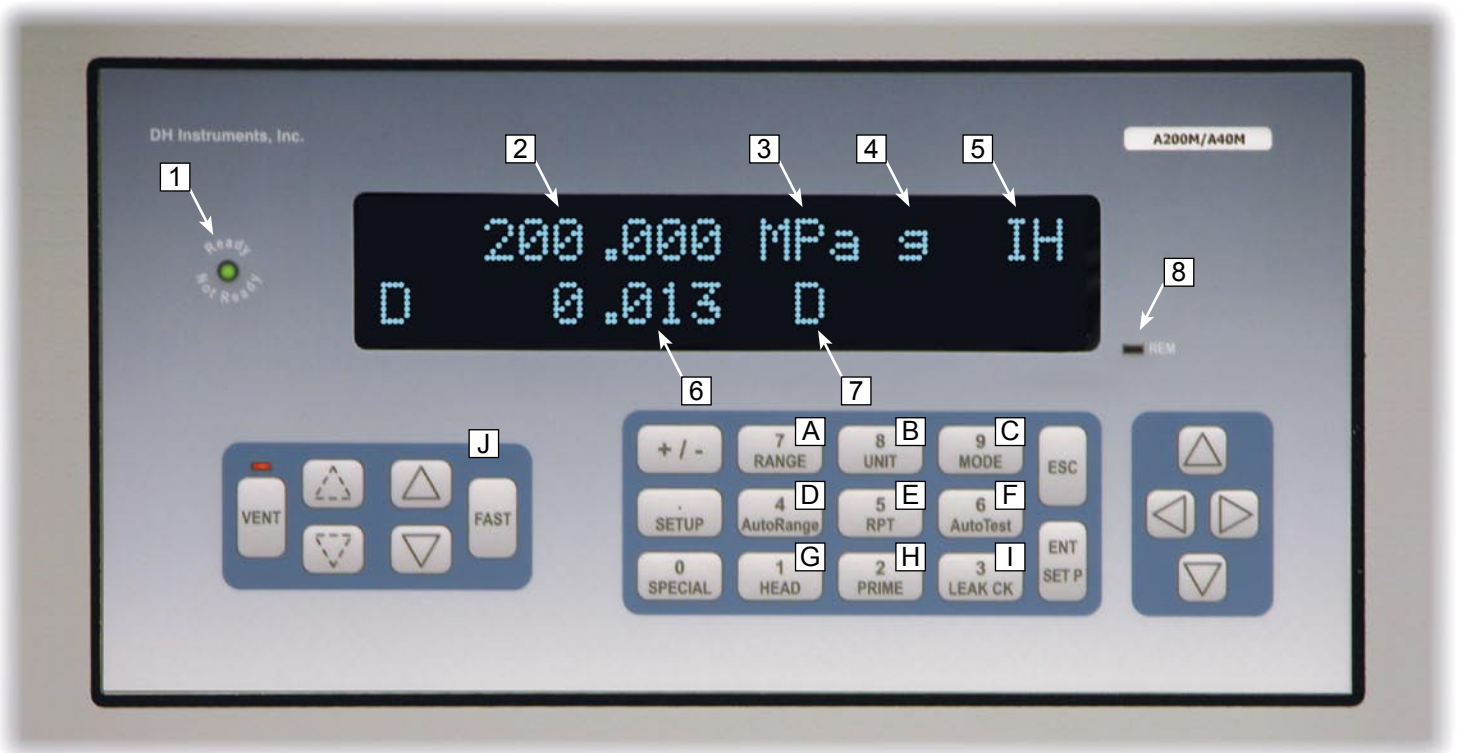
PPCH™, is a pressure generator/controller/calibrator for liquid pressure operation from 1 to 200 MPa (150 to 30 000 psi). As with the rest of **DHI's** PPC family of pressure controllers, the emphasis is on high end performance, minimizing measurement uncertainty and maintaining precise control over a very wide pressure range... in a compact and rugged instrument.

New, individually characterized, quartz reference pressure transducer (Q-RPT) modules increase precision and reduce measurement uncertainty. The AutoRange™ feature supports infinite ranging, automatically optimizing all aspects of operation for the exact range to be explored and taking pressure controller rangeability to a new level.

A unique pressure generation and control system provides unlimited, on-demand pressure, very high control resolution and 10:1 pressure control turndown. Four different control modes are included for maximum versatility.

Open architecture allows reference pressure measurement to be internal to or remote from the controller. If desired, the reference can be located at the test measurement point and independently removed for recalibration.

With all of this, PPCH opens new doors in automated high pressure hydraulic calibration and test applications.



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| <ol style="list-style-type: none"> 1. Indication of pressure "Ready" (green) "Not Ready" (red) condition 2. Controlled pressure 3. Unit of measure 4. Measurement mode (absolute, gauge) 5. Active Q-RPT module (up to four possible) 6. Current deviation from target control value 7. Control mode and status 8. Remote activity indicator | <ol style="list-style-type: none"> A. Select between saved, user defined range configurations. B. Select pressure unit of measure. C. Select measurement mode (absolute, gauge). D. Automatically optimize measurement, control and safety features for the exact pressure range and mode of operation. E. View and select active Q-RPT (from up to four in PPC/RPM system). | <ol style="list-style-type: none"> F. Set up and run calibration sequences automatically, with tolerance testing, based on DUT tolerance, range and measurement mode. G. Make automatic fluid head corrections for differences in height between PPCH and DUT. H. Run automated test system prime and purge functions. I. Run leak test function. J. Direct pressure control keys for slewing, jogging and venting pressure. |
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QUARTZ REFERENCE PRESSURE TRANSDUCER (Q-RPT) MODULES

PPCH's outstanding pressure measurement specifications are made possible by **DHI's** exclusive quartz reference pressure transducer (Q-RPT) modules.

Q-RPTs measure pressure by measuring the change in the natural oscillating frequency of a quartz crystal with pressure induced stress. To be qualified for use in a Q-RPT module, each transducer is individually evaluated and characterized using automated primary pressure standards. Only transducers exhibiting required levels of linearity, repeatability and stability are selected. A proprietary compensation model, derived from more than 15 years experience with thousands of quartz pressure transducers, is applied to optimize the metrological characteristics needed in a transfer standard.

PPCH can be delivered with a low cost utility sensor for applications in which the high precision and stability of a Q-RPT are not required.

Q-RPTs AVAILABLE FOR PPCH

Q-RPT DESIGNATION	SI VERSION MAXIMUM RANGE Absolute Gauge [MPa]	US VERSION MAXIMUM RANGE Absolute Gauge [psi]
A200M ¹	200	30 000
A140M ¹	140	20 000
A100M ¹	100	15 000
A70M	70	10 000
A40M	40	6 000
A20M	20	3 000

1. Hi Q-RPT only, not available in Lo Q-RPT position.

INFINITE RANGING™ AND AUTO RANGE™

There's a lot more to covering a wide range of test devices with a single pressure controller than "% of reading" measurement uncertainty.

In addition to the necessary measurement uncertainty, PPCH offers the full pressure control and feature adaptability that are needed for true rangeability in test and calibration applications.

Infinite Ranging gives PPCH unprecedented versatility in adapting to a wide variety of devices to be tested. With the easy to use AutoRange function, a few simple key strokes or a single remote command string at the start of a test adapts every feature of the controller to optimize it for a specific range.

OPEN ARCHITECTURE

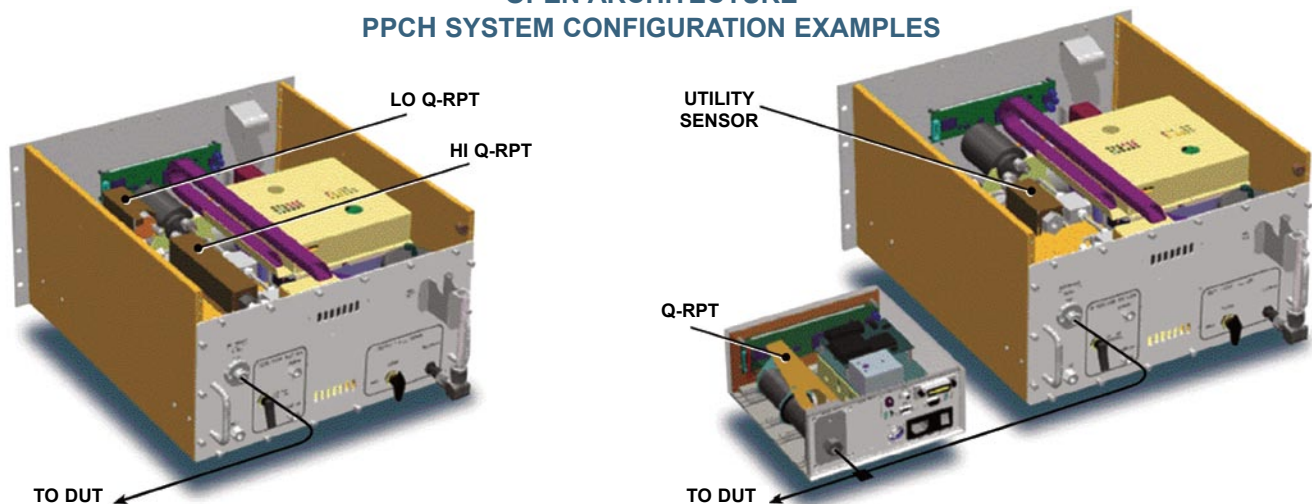
A PPCH controller can be configured with up to four Q-RPT modules. These can be internal or external to the PPCH controller. External Q-RPTs are in **DHI RPM4™** Reference Pressure Monitors. The RPM4's Q-RPTs then become part of the PPCH system and are managed by PPCH. External Q-RPTs must be disconnected or protected by valves when PPCH is used at pressure greater than the external Q-RPT range.

Examples of possible PPCH system configurations include:

- A PPCH with one or two built-in Q-RPTs to act as a stand alone, "one box" controller/calibrator package.

- A PPCH with no internal Q-RPTs and an external Q-RPT to configure a system whose reference pressure measurement is remote from the controller. This configuration is ideal when it is advantageous for the reference to be removed from the system (e.g. for recalibration) while leaving the controller installed or to locate the reference measurement in closer proximity to the device or system under test.
- A PPCH with no built-in Q-RPTs to act as a low cost automated pressure setting and controlling device (for example to automate pressure control in a PG7000™ piston gauge system).

OPEN ARCHITECTURE PPCH SYSTEM CONFIGURATION EXAMPLES



FEATURES, FEATURES, FEATURES

PPCH includes all the features you expect in today's state of the art instruments and much more... pressure "ready/not ready" indicator with user adjustable criteria... intelligent AutoZero™ function... 16 SI and US pressure units... automatic fluid pressure head correction... on-board, programmable calibration sequences

with DUT tolerance testing... remote [ENTER] footswitch for hands free test execution... valve drivers option for system design... automated leak testing routines... RS232 and IEEE-488 communications... FLASH memory for simple and free embedded software upgrades from www.dhainstruments.com.

ORDERING INFORMATION

CONFIGURING A PPCH MODEL NUMBER...

- Determine maximum controlled pressure required. Select...
 - PPCH-200M for 200 MPa (30 000 psi) • PPCH-100M for 100 MPa (15 000 psi)
 - PPCH-140M for 140 MPa (20 000 psi) • PPCH-70M for 70 MPa (10 000 psi)
- Decide whether Q-RPTs will be internal (built-in to PPCH) and/or external (in remote RPM4).

- If Q-RPTs are to be built-in to the PPCH, select one or two Q-RPTs from the Q-RPTs table on page 2. Lo Q-RPT must be A70M or lower.
- If Q-RPT(s) are to be external to the PPCH, configure an appropriate RPM4 using the RPM4 brochure. Note that the maximum pressure of the PPCH defines the maximum pressure of the PPCH system.

For a PPCH with no internal Q-RPT (utility sensor only)

PPCH-*nnnM*

Where: **nnnM** Indicates the PPCH controller's designation (200M, 140M, 100M or 70M).

For a PPCH with one or two internal Q-RPTs

PPCH-*nnnM AnnnMc1/AnnnMc2*

Where: **nnnM** Indicates the PPCH controller's designation.
AnnnMc1 Indicates the Hi RPT designation.
c indicates class (s for Standard, u for utility sensor if there is no Hi Q-RPT).
AnnnMc2 Indicates the Lo Q-RPT designation.
c indicates class (always s for Standard).
 Leave blank if there is no Lo Q-RPT.

OPTIONS

DESIGNATOR	DESCRIPTION
PPCH 04-02	SI units version
PPCH 05-01	CE mark
PPCH 06-01	Enclosure (for bench applications)
PPCH 07	Special calibration
PPCH 08-SP	Special fluid

ACCESSORIES

DESIGNATOR	PART NO.	DESCRIPTION
RPM4	see RPM4 brochure	Reference pressure monitor for external Q-RPTs
Footswitch	401886	Remote [ENTER] footswitch
RS232 Cable	100847	9 pin, 2 m for PPC3 COM1 or PPC3 to RPM4 connection
Reservoir, 4l	402102	External fluid reservoir

SPECIFICATIONS

GENERAL

Power Requirements	85 to 264 VAC, 50/60 Hz, 75 W max
Normal Operating Temperature Range	15 to 35 °C
Vibration	Meets MIL-T-28800D
Weight (Typical)	50 kg approx (110 lb)
Dimensions	30 cm H x 52 cm W x 50 cm D (12 in. x 20.5 in. x 20 in.) with enclosure 6U H rack mount version
Communications Ports	RS232 (COM1, COM2), IEEE-488.2
Operating Modes	Gauge, absolute
Pressure Ranges	Atmosphere to 200 MPa (30 000 psi)

Operating Media	Sebacate oil standard Others optional (consult DHI)
Internal Reservoir Volume	250 cc (external unlimited)
Drive Air Supply	70M, 140M 500 kPa (75 psi), 300 l/m (10 cfm), 450 l/m (15 cfm) 100M, 200M 700 kPa (100 psi), 300 l/m (10 cfm), 450 l/m (15 cfm)
Pressure Connections	DRIVE AIR SUPPLY 1/8 in. NPT F TEST DH500 (equivalent to AE F250C, HIP HF4)
Utility Sensor Precision/Resolution	± 0.10 % span / 0.001 % span
Drivers	(8) 12V, 1 A max total output
CE Conformance	Available, must be specified

PRESSURE CONTROL

Control Modes	
Dynamic	Sets target pressure within hold limit and continuously adjusts pressure to remain at target value.
Static	Sets target pressure within hold limit and shuts off control, allowing pressure to stabilize naturally.
Monotonic	Sets pressure to target, then maintains very slow ramp in same direction as pressure increment.
Ramp	Sets and maintains user specified rate of change of pressure.
Piston Gauge Control	PPCH is controlled by PG7302™ to automate piston gauge pressure control.

Control Precision	To ± 0.003 % of Q-RPT span
Control Volume	0 to 100 cc, 50 cc optimum (operates in larger volumes but pressure stabilizing time increases)
Control Speed	
Slew rate (0 to full scale)	60 sec.
Dynamic mode typical time to Ready	90 to 120 sec. (Reduced by increasing hold limit or using monotonic control)
Lowest Controllable Pressure	1 MPa (150 psi)(lower in optimum conditions and with PG7302)

MEASURED AND DELIVERED PRESSURE (Q-RPT)

Warm Up Time	30 minute temperature stabilization recommended from cold power up	
Resolution	To 1 ppm, user adjustable	
Calibration	A2LA accredited calibration report included	
Q-RPTs	Less than A200M	A200M
Precision ¹	± 0.012 % of reading ⁵	± 0.015 % of reading ⁵
Predicted One Year Stability ²	± 0.005 % of reading ⁵	± 0.005 % of reading ⁵
Measurement Uncertainty ³	± 0.013 % of reading ⁵	± 0.018 % of reading ⁵
Delivered Pressure Uncertainty (Dynamic Control Mode) ⁴	± 0.016 % of reading ⁵	± 0.020 % of reading ⁵

- Combined linearity, hysteresis and repeatability.
- Predicted one year stability limit (k=2) assuming regular use of AutoZero function. AutoZero occurs automatically when vented in gauge mode, by comparison with a barometric reference in absolute mode. Absolute mode predicted one year stability without use of AutoZ is ± (0.005 % Q-RPT span + 0.005 % of reading).
- Maximum deviation of the Q-RPT indication from the true value of applied pressure including precision, predicted one year stability, temperature effect and calibration uncertainty, combined and expanded (k=2) following the ISO "Guide to the Expression of Uncertainty in Measurement."
- Maximum deviation of the PPCH controlled pressure from the true value including measurement uncertainty and dynamic control hold limit.
- % of reading applies to 30 to 100 % of Q-RPT span. Under 30 % of Q-RPT span, uncertainty is a constant value obtained by multiplying the % of reading value by 30 % of Q-RPT span.

Due to a policy of continuous improvement, all specifications contained in this document are subject to change without notice.

AutoRange, COMPASS, Infinite Ranging, PG7000, PG7302, PPCH and RPM4 are trademarks, registered and otherwise, of **DH Instruments, a Fluke Company.**

Products described in this brochure are protected by US and international patents and patents pending.

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